Package ‘tables’

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Author Duncan Murdoch
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Output may be in LaTeX, HTML, plain text, or an R matrix for further processing.
Maintainer Duncan Murdoch <murdoch@stats.uwo.ca>
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Include all columns of a dataframe.

Description

This constructs a formula object for all the columns of a dataframe.

Usage

```
all(df, numeric=TRUE, character=FALSE, logical=FALSE, factor=FALSE,
    complex=FALSE, raw=FALSE, other=FALSE,
    texify=TRUE)
```

Arguments

- `df` - The dataframe in which to find the columns.
- `numeric`, `character`, `logical`, `factor`, `complex`, `raw` - Whether to include columns of specified types. See the Details below.
- `other` - Whether to include columns that match none of the previous types.
- `texify` - Whether to escape LaTeX special characters in column names.

Details

This function constructs a formula from the columns of a dataframe. By default, only numeric columns are included. The arguments `numeric`, `character`, `logical`, `factor`, `complex` and `raw` control the inclusion of columns of the corresponding types. The argument `other` controls inclusion of any other columns.

If these arguments are `TRUE`, such columns will be included in the formula.

If a function (or the name of a function given as a character string) is passed, such columns will be transformed by the function before inclusion. For example, `all(df, factor=as.character)` will convert all factor columns into their character representation for inclusion.

In other cases, the columns will be skipped.
AllObs

Value

Language to insert into the table formula to achieve the desired table.

Examples

# Show mean and sd of all numeric columns in the iris data
\[ \text{tabular}( \text{Species} \sim \text{All(iris)}*(\text{mean} + \text{sd}), \text{data}=\text{iris}) \]

AllObs

Display all observations in a table.

Description

These functions generate the code for a \texttt{tabular} table to include all observations in a dataset, possibly divided up according to other factors.

Usage

\begin{verbatim}
AllObs(data = NULL, show = FALSE, label = "Obsn.", within = NULL)
RowNum(within = NULL, perrow = 5, show = FALSE, label = "Row", data = NULL)
\end{verbatim}

Arguments

\begin{itemize}
\item \textbf{data} \hspace{1cm} The full dataset, used only to find the number of observations.
\item \textbf{show} \hspace{1cm} Whether to show the observation number or row number in the table.
\item \textbf{label} \hspace{1cm} The label to use when \texttt{show} = \texttt{TRUE}.
\item \textbf{within} \hspace{1cm} A factor or list of factors by which to break up the observations.
\item \textbf{perrow} \hspace{1cm} How many observations per row when \texttt{RowNum} is used in the row specification, or per column when it is part of the column specification.
\end{itemize}

Details

\texttt{AllObs} is used to display all of the observations in a dataset. It generates a (usually undisplayed) factor with a different level for each observation, sets a function to display the value, and calls \texttt{DropEmpty} to suppress display of empty rows, columns or cells.

If the \texttt{within} argument is specified in \texttt{AllObs}, the factor levels are restarted within each grouping. (\texttt{within} is interpreted as the \texttt{INDEX} argument of \texttt{tapply}, with one exception described below.) This may be useful when displaying the observation number, and is definitely useful if \texttt{AllObs} is used as a column specification in the table. It will also save some computation time if the table is very large, since fewer factor levels will be generated and later dropped.

\texttt{RowNum} is unlikely to be useful in a table by itself, but is helpful when displaying large datasets with \texttt{AllObs}. It allows a large number of observations to be broken into several rows and columns.

Because \texttt{RowNum} affects both rows and columns, its use is somewhat unusual. Normally it should be called before calling \texttt{tabular}, and its result saved in a variable. That variable (e.g. \texttt{rownum}) is
used in the row specification for the table wrapped in \( I() \), and in the column specification of the table in the \texttt{within} argument to \texttt{AllObs}. (This is the exception mentioned above.)

Despite its name, \texttt{RowNum} can be used as a column specifier, if you’d prefer column-major ordering of the values displayed in the table.

**Value**

Both \texttt{AllObs} and \texttt{RowNum} return language objects to be used on \texttt{tabular} formulas.

**See Also**

\texttt{tabular, DropEmpty}

**Examples**

\begin{verbatim}
  tabular(Factor(cyl)*Factor(gear)*AllObs(mtcars) ~
        rownames(mtcars) + mpg, data=mtcars)
  rownum <- with(mtcars, RowNum(list(cyl, gear)))
  tabular(Factor(cyl)*Factor(gear)*I(rownum) ~
          mpg * AllObs(mtcars, within = list(cyl, gear, rownum)),
          data=mtcars)
\end{verbatim}

---

**Description**

The \texttt{Arguments} \texttt{pseudo-function} enables the use of analysis functions that take multiple arguments.

**Usage**

\texttt{Arguments(...)}

**Arguments**

\ldots \hspace{1cm} \text{Arguments to pass to the analysis function.}

**Details**

The arguments to \texttt{Arguments} are evaluated in full, then those which are length \( n \) are subsetted for each cell in the table.

If no analysis variable has been specified, but \texttt{Arguments()} has been, then the analysis function will be called with arguments matching those given in \ldots. If an analysis variable was specified, it will be inserted as an unnamed first argument to the analysis function.

The \texttt{Arguments()} entry will not create a heading.

Only one \texttt{Arguments()} specification may be active in any term in the \texttt{tabular} formula.
Pseudo-functions

This is a "pseudo-function": it takes the form of a function call, but is never actually called: it is handled specially by `tabular`.

See Also

`Percent` for a different way to specify a multiple argument analysis function.

Examples

```r
# This is the example from the weighted.mean help page
wt <- c(5, 5, 4, 1)/15
x <- c(3.7, 3.3, 3.5, 2.8)
gp <- c(1, 1, 2, 2)
tabular((Factor(gp) + 1)
    ~ weighted.mean(x, arguments(w = wt))
)
```

---

**as.matrix.tabular**  
*Convert tabular object to matrix*

**Description**

Convert a tabular object to a matrix of the strings that would print, or a matrix of values.

**Usage**

```r
## S3 method for class 'tabular'
as.matrix(x, format = TRUE,
    rowLabels = TRUE, colLabels = TRUE, justification = "n", ...)
```

**Arguments**

- `x`  
  A "tabular" object.
- `format`  
  How to format; see Details below.
- `rowLabels, colLabels`  
  Whether to include the row or column labels; only used if `format = TRUE`.
- `justification`  
  How to justify values; only used if `format = TRUE`.
- `...`  
  Other parameters to pass to `format.tabular`.

**Details**

If `format=TRUE`, then a matrix of formatted strings is produced. If not, then the `format` argument is assumed to be a function (or name of a function passed as a character vector) to convert the list-mode matrix to another mode, e.g. `as.numeric`.

**Value**

A matrix.
Examples

```r
model <- tabular( (Species + 1) ~ (n=1) + Sepal.Length + Sepal.Width, data=iris )
```

Description

These functions construct or copy labels onto an existing matrix or dataframe.

Usage

```r
as.tabular(x, like = NULL)
## Default S3 method:
as.tabular(x, like = NULL)
## S3 method for class 'data.frame'
as.tabular(x, like = NULL)
```

Arguments

- `x` The object to convert.
- `like` If not NULL, should be a tabular object with the same number of rows and columns as `x`. Its labels will be used on the result.

Value

A tabular object.

See Also

`as.matrix.tabular`

Examples

```r
model <- tabular( (Species + 1) ~ (n=1) + Sepal.Length + Sepal.Width, data=iris )
model
as.tabular(matrix(1:12, 4,3), like=model)
```
**DropEmpty**

---

**DropEmpty pseudo-function**

---

**Description**

Pseudo-function to indicate that rows or columns containing no observations should be dropped.

**Usage**

DropEmpty(empty = "", which = c("row", "col", "cell"))

**Arguments**

- **empty** String to use in empty cells.
- **which** A vector indicating what should be dropped. See the Details below.

**Details**

If the `which` argument contains "row", then any row in the table in which all cells are empty will be dropped. Similarly, if it contains "col", empty columns will be dropped. If it contains "cell", then cells in rows and columns that are not dropped will be set to the empty string.

**Pseudo-functions**

This is a “pseudo-function”: it takes the form of a function call, but is never actually called: it is handled specially by `tabular`.

**Examples**

df <- data.frame(row = factor(1:10), value = rnorm(10))
subset <- df[sample(10, 5), , drop = FALSE]

# Some rows did not get selected, so this looks ugly
tabular(row ~ value*mean, data = subset)

# This only shows rows with data in them
tabular(row*DropEmpty() ~ value*mean, data = subset)

# This shows empty cells as "(empty)"
tabular(row*DropEmpty("(empty)", "cell") ~ value*mean, data = subset)
Description

Format controls the formatting of the cells it applies to. Format is mainly for internal use.

Usage

Format(…)
Format(n)

Arguments

… Arguments to pass to a formatting function, or a call to a formatting function.
n A format number.

Details

The Format pseudo-function changes the formatting of table cells, and it specifies that all values it applies to will be formatted together.

In the first form, the “call” to Format looks like a call to format, but without specifying the argument x. When tabular() formats the output it will construct x from the entries in the table governed by the Format() specification, and pass it to the standard format function along with the other arguments.

In the second form, the “call” to Format contains a call to a function to do the formatting. Again, an argument x will be added to the call, containing the values to be formatted.

In the first form, or if the explicit function is named format, any cells in the table with character values will not be formatted. This is done so that a column can have mixed numeric and character values, and the numerics are not converted to character before formatting.

The pseudo-function .Format is mainly intended for internal use. It takes a single integer argument, saying that data governed by this call uses the same formatting as the format specification indicated by the integer. In this way entries can be commonly formatted even when they are not contiguous. The integers are assigned sequentially as the format specification is parsed; users will likely need trial and error to find the right value in a complicated table with multiple formats.

Pseudo-functions

This is a “pseudo-function”: it takes the form of a function call, but is never actually called: it is handled specially by tabular.
Examples

# Using the first form
tabular( (Sepal.Length+Sepal.Width) ~
        Format(digits=2)*(mean + sd), data=iris )

# The same table, using the second form
tabular( (Sepal.Length+Sepal.Width) ~
        Format(format(digits=2))*(mean + sd), data=iris )

<table>
<thead>
<tr>
<th>Heading</th>
<th>Heading pseudo-function</th>
</tr>
</thead>
</table>

Description

The Heading pseudo-function normally overrides the automatic heading on the following items in a table. Setting override=FALSE is used in automatically generated expressions.

Usage

Heading(name = NULL, override = TRUE, character.only = FALSE, nearData = TRUE)

Arguments

- **name**: A legal R variable name, or a character constant.
- **override**: Whether this heading should override one that is already present.
- **character.only**: If TRUE, the name argument will be interpreted as an expression evaluating to a character value.
- **nearData**: See Details below.

Details

This replaces the automatic heading or row label on the following item with the name or string as specified. If no argument is given, the heading or label is suppressed.

An alternative form of `Heading(name)` is `(name=...)`, where ... is an expression to be displayed in the table.

If override = FALSE, the label is only supplied if there is no other label. This is used in the code for `Factor`.

The nearData argument is rarely used. It affects the situation where "+" is used to join tables with different numbers of labels. If nearData = TRUE (the default), the shorter list of labels are pushed close to the data, i.e. to the right side for row labels, the bottom for column labels. If FALSE, they are pushed to the opposite side.

Pseudo-functions

This is a “pseudo-function”: it takes the form of a function call, but is never actually called: it is handled specially by `tabular`.
**Examples**

```r
tabular( (Sepal.Length + Sepal.Width) ~
          (Heading(Mean)*mean + (S.D.=sd)), data=iris )
```

```r
heading <- "Variable Heading"
tabular( (Sepal.Length + Sepal.Width) ~
          (Heading(heading, character.only = TRUE)*mean + (S.D.=sd)),
          data=iris )
```

---

**Hline**

*Add a horizontal line to a LaTeX table.*

**Description**

This function inserts a LaTeX directive to draw a full or partial line in a table.

**Usage**

```r
Hline(columns, nearData = FALSE)
```

**Arguments**

- `columns` Which columns should receive the line?
- `nearData` See the Details section of `Heading`.

**Details**

`Hline()` is not very flexible: it must be the leftmost header in a row specification for the table, i.e. `mean * Hline()` is not allowed. Anything to the right of the `Hline()` factor will be ignored.

**Value**

Produces an expression to insert a label which will be interpreted by LaTeX as a request for a horizontal line.

**Examples**

```r
latex( tabular( Species + Hline() + 1 ~ mean*Sepal.Width, data=iris ) )
```
Description

This is similar to `print.tabular`, but it inserts the code to display the table in an HTML table.

Usage

```r
## S3 method for class 'tabular'
html(object, file = "", options = NULL,
     id = NULL, append = FALSE, ...)
writeCSS(CSS = htmloptions()$CSS, id = NULL)
```

Arguments

- `object`: The tabular object.
- `file`: A filename or connection to which to write the HTML code, or "" to write to the standard output.
- `options`: A list of options to set for the duration of the call.
- `id`: A unique identifier to set for this table and the associated CSS style, or NULL, for no id.
- `append`: If TRUE, opens `file` for appending (if it is a filename rather than a connection).
- `...`: Settings for default formatting. See Details below.
- `CSS`: A character vector to use as CSS.

Details

The `html()` method produces HTML output suitable for inclusion in an HTML page.

In HTML, it is mainly the CSS style sheet that determines the look of the table. When formatting a table, `html.tabular` sets the CSS class according to the table’s `justify` setting; justifications of c("l", "c", "r") are translated to classes c("left", "center", "right") respectively; other strings will be passed through and used directly as class names. If the `id` value is not NULL, then it will be used as the CSS id selector when searching for a style. See `table_options` for a number of options that control formatting, including the default style sheet.

Value

The `html()` method writes the HTML code to `file` and returns a list containing that name, with class "html".

See Also

`print.tabular`, `latex.tabular`, `html`, `htmloptions`
**Examples**

```r
X <- rnorm(125, sd=100)
Group <- factor(sample(letters[1:5], 125, rep=TRUE))

tab <- tabular( Group ~ N+Format(digits=2)*X*{(Mean=mean) + Heading("Std Dev")*sd} )
save <- table_options()
table_options(rowlabeljustification="c")

f <- tempfile(fileext=".html")
con <- file(f, "wt")

html(tab, con, options=htmloptions(head=TRUE, table=FALSE))

writelines("<p>This table has pad = FALSE. The centered numbers look sloppy.<br>", con)

html(tab, con, options=htmloptions(head=FALSE, table=TRUE, pad=FALSE))

writelines("<p>This table has pad = FALSE and justification="r". The justification makes the columns of numbers look all right (except for the hyphens used as minus signs), but they are placed poorly relative to the labels.<br>", con)

html(tab, con, options=htmloptions(head=FALSE, table=TRUE, pad=FALSE, justification="r"))

writelines("<p>This one has pad = TRUE. It looks best, but if you cut and paste, the spacing characters may cause problems.<br>", con)

html(tab, con, options=htmloptions(head=FALSE, table=TRUE, pad=TRUE))

table_options(save)
close(con)
browseURL(f)
```

---

### Justify

**Justify pseudo-function**

**Description**

The **Justify pseudo-function** sets the justification of the following items in the table.

**Usage**

```
Justify(labels, data=labels)
```
Arguments

labels Justification to use for labels
data Justification to use for data.

Details

The justification can be an R name if that is syntactically valid, or a quoted string.

Pseudo-functions

This is a “pseudo-function”: it takes the form of a function call, but is never actually called: it is handled specially by `tabular`.

Examples

```r
tabular( Justify(c,1)+Heading(Var)*(Sepal.Length+Sepal.Width) ~
         Justify(c)*(mean + sd), data=iris )
```

```r
table_labels Retrieve or modify the row or column labels.
```

Description

These functions allow the row or column labels of a tabular object to be retrieved or modified.

Usage

```r
rowLabels(x)
rowLabels(x) <- value
colLabels(x)
colLabels(x) <- value
## S3 method for class 'tabularRowLabels'
x[i, j, ..., drop = FALSE]
## S3 method for class 'tabularColLabels'
x[i, j, ..., drop = FALSE]
```

Arguments

x A "tabular", "tabularRowLabels" or "tabularColLabels" object.
value A replacement
i, j, ..., drop Arguments used for subsetting the labels. See Details below.

Details

Subsetting the row labels does not allow the number of rows to be changed; likewise, subsetting the column labels does not allow the number of columns to be changed. To change both, subset the original "tabular" object.
Value
rowLabels and the corresponding subsetting method return an object of class "tabularRowLabels". colLabels and the corresponding subsetting method return an object of class "tabularColLabels". The assignment functions return "tabular" objects.

See Also
[.tabular

Examples
```
tab <- tabular((Species + 1) ~ (n=1) + Format(digits=2)*
       (Sepal.Length + Sepal.Width)*(mean + sd), data=iris)
collabels(tab)
collabels(tab) <- collabels(tab)[1,]
tab
```

---

**labelSubset**

Add a label to a logical vector.

Description
This function is mainly for internal use. It adds a label to a logical vector, so that the Percent pseudo-function can ignore it when forming a denominator.

Usage
```
labelSubset(subset, label)
```

Arguments
- **subset**: A logical vector describing a subset of the dataset.
- **label**: A character label to use to describe this subset in a call to Equal or Unequal within Percent.

Value
A vector of class "labelledSubset" with the label recorded as an attribute.

Author(s)
Duncan Murdoch

See Also
Percent
latex.tabular

Display a tabular object using LaTeX.

Description

This is similar to print.tabular, but it inserts the code to display the table in a LaTeX tabular environment.

Usage

```r
## S3 method for class 'tabular'
latex(object, file = "", options = NULL, append = FALSE, ...)
```

Arguments

- `object`: The tabular object.
- `file`: A filename or connection to which to write the LaTeX code, or "" to write to the standard output.
- `options`: A list of options to set for the duration of the call.
- `append`: If TRUE, opens `file` for appending (if it is a filename rather than a connection).
- `...`: Settings for default formatting. See Details below.

Details

The `latex()` method produces LaTeX output suitable for inclusion in a Sweave document.

Value

The `latex()` method returns x invisibly, and prints the LaTeX script to the console.

table_options() and booktabs() return the previous settings.

See Also

print.tabular, table_options, latex

Examples

```r
tab <- tabular( (Species + 1) ~ (n=1) + Format(digits=2)*
    (Sepal.Length + Sepal.Width)*(mean + sd), data=iris )
latex(tab)
save <- booktabs()
l latex(tab)
table_options(save)
```
latexNumeric  

*Process numeric LaTeX or HTML values.*

**Description**

This takes formatted strings as produced by `format` from numeric values, and modifies them to LaTeX or HTML code that retains the spacing, and renders minus signs properly. The default formatting in `tabular` uses this to maintain proper alignment.

**Usage**

```r
latexNumeric(chars, minus = TRUE, leftpad = TRUE, rightpad = TRUE, mathmode = TRUE)
htmlNumeric(chars, minus = TRUE, leftpad = TRUE, rightpad = TRUE)
```

**Arguments**

- **chars**: A character vector of numeric values.
- **minus**: Whether to pad cases with no minus sign with spacing of the same width.
- **leftpad, rightpad**: Whether to pad cases that have leading or trailing blanks with spacing matching a digit width per space.
- **mathmode**: Whether to wrap the result in dollar signs, so LaTeX renders minus signs properly.

**Value**

A character vector of the same length as `chars`, with modifications to render properly in LaTeX.

**Examples**

```r
latexNumeric(format(c(1.1, -1, 10, -10)))
htmlNumeric(format(c(1.1, -1, 10, -10)))
```

---

**Literal**

*Insert a literal entry into a table margin.*

**Description**

This allows insertion of arbitrary LaTeX text into a table.

**Usage**

```r
Literal(x, nearData = TRUE)
```
Arguments

- `x` A character string to insert.
- `nearData` See the Details section of `Heading`.

Details

In LaTeX the literal string should usually end with a `% comment character to avoid having a blank line inserted.

Value

Produces an expression to insert a label containing the literal text.

See Also

- `Hline`, which uses this to insert lines.

Examples

```
tabular( (Literal("Some text") + Species) ~
      All(iris)*mean, data=iris )
```

**Paste**

Generate terms to paste values together in table.

Description

This function generates a component of a table formula to output multiple columns with punctuation between. It is designed only for LaTeX output.

Usage

```
Paste(..., head, digits=2, justify="c", prefix="", sep="", postfix="",
       character.only = FALSE)
```

Arguments

- `...` Expressions to be displayed in the columns of the table. If they are named, they will get those names as headings, otherwise they will not be labelled.
- `head` If not missing, this will be used as a column heading for the combined columns.
- `digits` Will be passed to the `format` function. If `digits` is length one, all columns use a common format; otherwise they are formatted separately.
- `justify` One or more justifications to use on the individual columns.
- `sep` One or more separators to use between columns.
- `prefix, postfix` Additional text to insert before and after the group of columns.
- `character.only` If TRUE, the head argument will be interpreted as an expression evaluating to a character value.
Value

An expression which will produce the requested output in LaTeX.

Examples

```r
stderr <- function(x) sd(x)/sqrt(length(x))
latex( tabular( (Species+1) ~ Sepal.Length*
    PlusMinus(mean, stderr, digits=1), data=iris ) )
```

| Percent | Pseudo-function to compute a statistic relative to a reference set. |

Description

The `Percent` pseudo-function is used to specify a statistic that depends on other values in the table.

Usage

```r
Percent(denom = "all", fn = percent)
```

Arguments

- `denom` 
  How the reference set (the denominator in case of a percentage calculation) should be calculated. See below.
- `fn` 
  The two argument function to calculate the statistic.

Details

The function `fn` will be called with two arguments. The first argument is the usual “value vector” of values corresponding to this cell in the table, and the second is another vector of reference values, determined by `denom`.

The default value of `fn` is the `percent` function, defined as:

```r
function(x, y) 100*length(x)/length(y)
```

This gives the ratio of the number of values in the current cell relative to the reference values, expressed as a percentage. Using `fn = function(x, y) 100*sum(x)/sum(y)` would give the percentage of the sum of the values in the current cell to the sum in the reference set.

With the default `denom = "all"`, all values of the analysis variable in the dataset are used as the reference. Other possibilities are `denom = "row"` or `denom = "col"`, for which the values of the variable corresponding to the current row or column subset are used.

The special syntax `denom = Equal(...)` will record each expression in `...`. The reference set will be the cases with equal values of all expressions in `...` to those of the current cell. The similar form `denom = Unequal(...)` sets the reference values to be those that differ in any of the `...` expressions from the current cell. (In fact, these can be used somewhat more generally; see the vignette for details.)

Finally, other possible `denom` values are a logical vector, in which case the values marked `TRUE` are used, or anything else, which will be passed to `fn` as `y`. 
**Pseudo-functions**

Percent is a “pseudo-function”: it takes the form of a function call, but is never actually called: it is handled specially by `tabular`. Equal and Unequal are also pseudo-functions, but are only special when used in the denom argument to `Percent`.

**See Also**

`Arguments` for a different way to specify a multiple argument analysis function.

**Examples**

```r
x <- factor(sample(LETTERS[1:2], 1000, rep=TRUE))
y <- factor(sample(letters[3:4], 1000, rep=TRUE))
z <- factor(sample(LETTERS[5:6], 1000, rep=TRUE))

# These both do the same thing:
tabular( (x + 1)*(y + 1) ~ (z + 1)*(1+(RowPct=Percent("row"))))
tabular( (x + 1)*(y + 1) ~ (z + 1)*(1+(xyPct=Percent(Equal(x, y)))))
```

---

**PlusMinus**

*Generate x +/- y terms in table.*

---

**Description**

This function generates a component of a table formula to output two columns separated by a +/- sign. It is designed only for LaTeX output.

**Usage**

```r
PlusMinus(x, y, head, xhead, yhead, digits = 2, character.only = FALSE, ...)
```

**Arguments**

- `x, y`: Expressions to be displayed in the columns on the left and right of the +/- sign, respectively.
- `head`: If not missing, this will be used as a column heading for the two columns.
- `xhead, yhead`: If not missing, these will be used as individual column headings.
- `digits, ...`: Parameters to pass to the `format` function.
- `character.only`: If TRUE, the head, xhead and yhead arguments will be interpreted as expressions evaluating to character values.

**Value**

An expression which will produce the requested output in LaTeX.
Examples

```r
stderr <- function(x) sd(x)/sqrt(length(x))
latex( tabular( (Species+1) ~ Sepal.Length*
  PlusMinus(mean, stderr, digits=1), data=iris ) )
```

Use a variable as a factor to give rows in a table.

Description

The functions take a variable and treat it as a factor in a table. `RowFactor` is designed for \LaTeX\ output, adding extra spacing to make the table more readable. `Multicol` also works only in \LaTeX\, and displays the label in a style with the level on a line by itself, spanning multiple columns.

Usage

```r
Factor(x, name = deparse(expr), levelnames = levels(x), texify = TRUE,
  expr = substitute(x), override = TRUE)
RowFactor(x, name = deparse(expr),
  levelnames = levels(x),
  spacing = 3, space = 1, suppressfirst = TRUE,
  nopagebreak = "\nopagebreak ",
  texify = TRUE, expr = substitute(x),
  override = TRUE)
Multicol(x, name = deparse(expr), levelnames = levels(x),
  width=2, first=1, justify="l",
  texify = TRUE, expr = substitute(x),
  override = TRUE)
```

Arguments

- **x**: A variable to be treated as a factor.
- **name**: The display name for the factor.
- **levelnames**: The strings to use as levels of `x`.
- **texify**: If `TRUE`, characters that would be interpreted specially by \LaTeX\ are escaped (using \texttt{latex Translate}) so they will print properly.
- **expr**: The expression to use in evaluating the factor. Generally the same as the expression passed as `x`, but internal uses may differ.
- **override**: Should the name for the factor override any previously specified `Heading()` setting?
- **spacing**: Extra spacing will be added before every spacing lines.
- **space**: How much extra space to add, in ex units.
- **suppressfirst**: Whether to suppress the spacing in the first group.
- **nopagebreak**: \LaTeX\ macro to insert to suppress page breaks except between groups.
width How many columns should the label span?
first Which is the first column in which this label appears?
justify How should the label be justified in the columns?

Value
Language to insert into the table formula to achieve the desired table.

Examples

```r
tabular(Factor(1:10, "row") ~
    All(iris[1:10,])*Heading()*identity )
latex tabular( RowFactor(1:10, "", 5) ~
    All(iris[1:10,])*Heading()*identity )
```

Table Options

Set or query options for the table formatting.

Description
These functions set or query options for table formatting in LaTeX or HTML output.

Usage

```r
table_options(...)
booktabs(...)
htmloptions(head=TRUE, table=TRUE, pad=FALSE, ...)
```

Arguments

- `head` logical; enables all of the HTML header options
- `table` logical; enables output of all parts of the table itself
- `pad` logical; enables all of the HTML padding options
- `...` Any of the options listed in the Details below.

Details
The `table_options()` function sets a number of options that control formatting. Currently the options that affect both LaTeX and HTML output are:

- `justification = "c"` Default justification for the data columns in the table.
- `rowlabeljustification = "l"` Default justification for row labels.
- `doBegin`, `doHeader`, `doBody`, `doFooter`, `doEnd` These logical values (all defaults are `TRUE`) control the inclusion of specific parts of the output table.

These options are only used for LaTeX output:
table_options

```r

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>tabular = &quot;tabular&quot;</code></td>
<td>The LaTeX environment to use for the table. Other choices such as &quot;longtable&quot; might make sense.</td>
</tr>
<tr>
<td><code>toprule, midrule, bottomrule</code></td>
<td>The LaTeX macros to use for the lines in the table. By default they are all &quot;\hline&quot;.</td>
</tr>
<tr>
<td><code>titlerule = NULL</code></td>
<td>The LaTeX macro to use to underline multicolumn titles. If NULL, no underlining is done.</td>
</tr>
<tr>
<td><code>latexleftpad, latexrightpad, latexminus, mathmode</code></td>
<td>These control formatting of numbers in the table. If TRUE (the default), blanks in R’s formatting are converted to hard spaces in the LaTeX output, and negative signs are rendered properly. Generally this makes output look better, but the ‘.tex’ input may be harder to read.</td>
</tr>
</tbody>
</table>

These options are only used for HTML output:

- `doHTMLheader, doCSS, doHTMLbody` These control output of the material at the top of an HTML page.
- `HTMLhead, CSS, HTMLbody` These are the default strings to output when the corresponding element is selected. If present, the string "CHARSET" will be replaced with the result of `localeToCharset()` in the HTMLhead. The string "#ID" will be replaced with "#" followed by the id argument to `html.tabular` (or removed if that is blank).
- `HTMLcaption` This is an optional HTML caption for the table. If NULL, no caption is emitted.
- `HTMLleftpad, HTMLrightpad, HTMLminus` These control formatting of numbers in the table. If TRUE, blanks in R’s formatting are converted to hard spaces in the HTML output, and negative signs are rendered properly. Generally this makes output look better, but cut and paste from the table may include these special characters and not be recognized by other software. The default is FALSE.
- `HTMLattributes` This is a string to add to the "<table>" declaration at the top of the table. By default, the attributes are 'frame="hsides" rules="groups"'. These set horizontal rules on the top and bottom of the table and between the header, body, and footer (if present).
- `HTMLfooter` This is NULL for no footer, or HTML code to insert in the table. Note that in HTML the footer should be specified before the body of the table; `html.tabular` will do this if both are written in the same call.

These may be set persistently by calling `table_options()`, or just for the duration of the call by passing them in a list via `latex(options=list(...) )`. Additional ... arguments to `latex` are passed to `format`.

The `booktabs()` function sets the `table_options()` values to different defaults, suitable for use with the `booktabs` LaTeX package.

The `htmloptions()` function constructs a list suitable for the options argument to `html.tabular`, with grouping of options that rarely differ from each other.

Note that any LaTeX code can be used in the rule options; for example, see the longtable example in the vignette. Material to go above the headers goes into `toprule`, material between the headers and the body goes into `midrule`, and material at the bottom of the table goes into `bottomrule`.

Value

`table_options()` and `booktabs()` return the previous settings.

`htmloptions()` returns a list of settings without changing the defaults.
```
tabular

Description

Computes a table of summary statistics, cross-classified by various variables.

Usage

```r
tabular(table, ...) # Default S3 method:
tabular(table, ...) # S3 method for class 'formula'
tabular(table, data = NULL, n, suppressLabels = 0, ...) # S3 method for class 'tabular'
print(x, justification="n", ...) # S3 method for class 'tabular'
format(x, digits=4, justification="n", latex=FALSE, html=FALSE, 
    leftpad = TRUE, rightpad = TRUE, minus = TRUE, 
    mathmode = TRUE, ...)
```

Examples

```r
tab <- tabular((Species + 1) ~ (n=1) + Format(digits=2) * 
    (Sepal.Length + Sepal.Width) * (mean + sd), data=iris)
latex(tab)
save <- booktabs()
latex(tab)
table_options(save)

f <- tempfile(fileext = ".html")
browseURL( html(tab, f, 
    options=htmloptions(HTMLcaption="Table of Iris Data", 
        pad = TRUE))$file )
```
Arguments

- **table**: A table expression. See the Details below.
- **data**: An optional dataframe, list or environment in which to look for variables in the table.
- **n**: An optional value giving the length of the data. See the Details below.
- **suppressLabels**: How many initial labels to suppress?
- **x**: The object to print, format, or subset.
- **digits, ...**: In the print and format methods, how many significant digits or other parameters to show by default? See Formatting below.
- **justification**: The default justification to use in the table.
- **latex**: If TRUE, the latexNumeric function will be applied when formatting numeric columns after format, to maintain spacing and handle signs properly.
- **html**: If TRUE, the htmlNumeric function will be applied when formatting numeric columns after format, to maintain spacing and handle signs properly.
- **leftpad, rightpad, minus, mathmode**: Options to pass to latexNumeric or htmlNumeric to control details of formatting. See those pages for details.
- **i, j, drop**: The usual arguments for matrix indexing, but see the Details below.
- **deparse.level**: Ignored. (Present because the generic requires it.)

Details

For the purposes of this function, a "table" is a rectangular array of values, computed using a formula expression. The left hand side of the formula describes the rows of the table, the right hand side describes the columns.

Within the expression for the rows or columns, the operators +, *, and = have special meanings.

The + operator represents concatenation, so that \( x + y \sim z \) says to show the rows corresponding to \( x \) above the rows corresponding to \( y \).

The * operator represents nesting, so that \( x*y \sim z \) says to show the rows of \( y \) within each row corresponding to \( x \).

The = operator sets a new name for a term; it is an abbreviation for the Heading() pseudo-function. ("Pseudo-functions" are described in the tables vignette.) Note that = has low operator precedence and may be confused by the parser with setting function arguments, so parentheses are usually needed.

Parentheses may be used to group terms in the usual arithmetic way, so \( (x + y)*(u + v) \) is equivalent to \( x*u + x*v + y*u + y*v \).

The names Format, .Format and Heading have special meaning; see the section on Formatting below.

The interpretation of other terms in the formulas depends on how they evaluate.

If the term evaluates to a function, it should be a summary function that produces a scalar value when applied to a vector of values, and that scalar will be displayed in the table. For example, \( (\text{mean} + \text{var}) \sim x \) will display the mean of \( x \) above the variance of \( x \). If no function is
specified, length is assumed, so the table will display counts. (At most one summary function may be specified in any one term, so `mean*var` would be an error.)

If the term evaluates to a logical vector, it is assumed to specify a subset. For example, `~ (x > 3) + (x > 5)` will tabulate the counts of those two subsets.

If the term evaluates to a factor, it generates multiple rows or columns, corresponding to the different levels of the factor. For example if `A` has three levels, then `A ~ mean*x` will calculate the mean of `x` within each level of `A`.

If the term evaluates to a language object, it is treated as a macro, and expanded in place in the formula.

Other terms are assumed to be R expressions producing a vector of values to be summarized in the table. Only one vector of values can be specified in any given term, but different terms can summarize different values. `is.atomic` must evaluate to `TRUE` for these values for them to be recognized.

All logical, factor or other values in the table should be the same length, as if they were columns in a dataframe (but they can be computed values). If `n` is missing but `data` is a dataframe, `n` is set from that. Otherwise, if terms such as `1` appear in a table, the length is assumed to be the same as for previous terms. As a last resort, set the `n` argument in the call to `tabular()` explicitly.

The "[]" method extracts a subset of the table. For indexing, consider the table to consist of a matrix containing the values. If `drop=TRUE`, the labels and attributes are dropped. If `drop=FALSE`, the default, the `i` and `j` indices must select a rectangular block of the table; matrix indexing (using a two column matrix or a full matrix of logical values) is not supported.

**Value**

An object of S3 class "tabular". This is a matrix of mode list, whose entries are computed summary values, with the following attributes:

- `rowLabels`: A matrix of labels for the rows. This will have the same number of rows as the main matrix, but may have multiple columns for different nested levels of labels. If a label covers multiple rows, it is entered in the first row, and NA is used to fill following rows.

- `colLabels`: Like `rowLabels`, but labelling the columns.

- `table`: The original table expression being displayed. A list of the original format specifications are attached as a "fmtlist" attribute.

- `formats`: A matrix of the same shape as the main result, containing NA for default formatting, or an index into the format list.

**Formatting**

The `tabular()` function does no formatting of computed values, but it records requests for formatting. The `format.tabular()`, `print.tabular()` and `latex.tabular()` functions make use of these requests.

By default, columns are formatted using the `format` function, with arguments `digits` and any other arguments passed in . . . . Each column is formatted separately, similarly to how a matrix is printed by default.
To request special formatting, four pseudo-functions are provided. The first is `Format`. Normally it includes arguments to pass to the `format()` function, e.g. `Format(digits=2)`. It may instead include a call to a function, e.g. `Format(sprintf("%.2f"))`. In either case the summary values from cells in the table that are nested below the `Format` specification will be passed to that function in an argument named `x`, i.e. in the first example, the values would be formatted using `format(digits=2, x=values)`, and in the second, using `sprintf("%.2f", x=values)`. Users can supply their own function to be used for formatting; it should take values in a named argument `x` and return a character vector of the same length.

This can be used to control formatting in multiple columns at once. For example, `Format(digits=2)*(mean + sd)` will print both the mean and standard deviation in a single call to `format`, guaranteeing that the same number of decimal places is used in both. (The iris example below demonstrates this.)

If the `latex` argument to `latex.tabular` is TRUE, then an effort is made to retain spacing, and to convert minus signs to the appropriate type of dash using the `latexnumeric` function.

The second pseudo-function `.Format` is mainly intended for internal use. It takes a single integer argument, saying that data governed by this call uses the same formatting as another format specification. In this way entries can be commonly formatted even when they are not contiguous. The integers are assigned sequentially as the format specification is parsed; users will likely need trial and error to find the right value in a complicated table with multiple formats.

A third pseudo-function is `justify`. It takes character values or names as arguments; how they are treated depends on the output format. In `format.tabular`, coarse justification is done to left, right or center, using `l`, `r` or `c` respectively. For LaTeX formatting, any string acceptable as a justification string to LaTeX will be passed on.

A final pseudo-function is `heading`. Use this function in the row definitions to set a heading on the following column of row labels. (Internally this is how the headings on factor columns are implemented.) If it is called with no argument, it suppresses the following heading. The `suppressLabels=n` argument to `tabular()` is equivalent to repeating `heading()` `n` times at the start of the table formula. The `=` operator is an abbreviation for `heading()`; see above.

**tabular methods**

The default `tabular` method just applies `as.formula` to `table`, and then calls `tabular.formula`. The `tabular.formula` method is the main workhorse of the package. Other authors who wish to produce tables directly from their own structures should normally create a formula whose environment contains all mentioned variables and call `tabular.formula` with appropriate arguments.

**Author(s)**

Duncan Murdoch

**References**

This function was inspired by my 20 year old memories of the SAS TABULATE procedure.

**See Also**

`table` and `ftable` are base R functions which produce tables of counts. The `tables` vignette has many more examples and displays the formatted output.
Examples

```r
tabular( (Species + 1) ~ (n=1) + Format(digits=2)* (Sepal.Length + Sepal.Width)*(mean + sd), data=iris )

# This example shows some of the less common options
Sex <- factor(sample(c("Male", "Female"), 100, rep=TRUE))
Status <- factor(sample(c("low", "medium", "high"), 100, rep=TRUE))
z <- rnorm(100)+5
fmt <- function(x) {
  s <- format(x, digits=2)
  even <- (1:length(s)) %% 2 == 0
  s[even] <- sprintf("%s", s[even])
  s
}
tab <- tabular( Justify(c)*Heading() *z*Sex*Heading(Statistic)*Format(fmt) *(mean+sd) ~ Status )
tab
tab[1:2, c(2,3,1)]
```

write.csv.tabular

Write table to file in CSV or other format.

Description

This writes the formatted table into a CSV or other delimited file, for import into a spreadsheet or other report writer.

Usage

```r
write.csv.tabular(x, file="", justification = "n", row.names=FALSE, ...)
write.table.tabular(x, file="", justification = "n", row.names=FALSE, col.names=FALSE, ...)
```

Arguments

- `x` An object from `tabular`.
- `file` A filename or connection to which to write.
- `justification` Parameter to pass to `format.tabular`.
- `row.names`, `col.names` Parameters to pass to `write.csv` or `write.table`.
- `...` Parameters to pass to `format.tabular` or `write.table`; see Details below.
write.csv.tabular

Details

write.csv.tabular writes a simple version of the table (similar to what is produced by print.tabular) to the given connection in CSV format, using write.csv. write.table.tabular does similarly using the more general write.table.

The optional arguments in ... are sent to write.csv/write.table if their names exactly match parameters to write.table; otherwise, they are sent to format.tabular.

Value

The return value from write.csv or write.table.

Examples

## Not run:
# This writes a table to the clipboard on Windows using tab delimiters, for
# easy import into a spreadsheet.

write.table.tabular(
  tabular( (Species + 1) ~ (n=1) + Format(digits=2)*
            (Sepal.Length + Sepal.Width)*(mean + sd), data=iris ),
  "clipboard", sep="\t")

## End(Not run)
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